

# MACHINE DESIGN

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Including 26 regular issues of MACHINE DESIGN plus four special issues—*The Fasteners Reference Issue*, *The Mechanical Drives Reference Issue*, *The Metals Reference Issue*, and *The Electric Motors Reference Issue*. Only articles and editorial items one-half page or larger are indexed.

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Determining Cam Profiles	Myatt	6/10 174 (3.0)
Toggle Mechanisms	Selman	7/22 185 (2.5)
Bearing Reliability and Capacity	Mischke	9/30 139 (2.0)
Storable Tubular Extendible Member	Rimrott	12/9 156 (10.0)
Intermittent Rotary Motion	Bickford	12/23 119 (13.0)
Pull Tightens Grippers Pinch	Scan	1/7 125 (0.5)
Rectangular Cam Makes "Push-Push" Switch	Scan	2/4 115 (0.7)
Orbiting Ball Provides High-Speed Wiggle	Scan	3/18 178 (0.5)
Orbiting Lever Governs Torque Tunable Stethoscope Listens Discriminately	Scan	4/1 113 (1.0)
Convex Cam Clamps Itself	Scan	4/29 215 (0.6)
Pawls Deliver Uniform Torque	Scan	5/13 191 (0.6)
Flexible Diffuser Adjusts to Air Flow	Scan	5/27 139 (0.5)
Piston Cam Actuates Cutter	Scan	6/24 143 (1.0)
Stepped Pawls Subdivide Ratchet Increment	Scan	7/22 148 (0.5)
"Saw-Tooth" Blades Vary Mix Speed	Scan	8/19 157 (1.0)
Disappearing Cam Lobe Controls Engine Valve	Scan	8/19 160 (0.5)
Rolling Crank Amplifies Motion	Scan	9/2 123 (1.0)
Linkage Adjusts Itself for Temperature Changes	Scan	9/2 124 (0.5)
Slide Track Indexes Whirling Plug-In	Scan	9/16 174 (1.0)
Split Arbor Flexes to Grip	Scan	10/28 152 (0.5)
Spring-Floated Fingers Regulate Torque	Scan	12/23 132 (0.5)
Radial Squeeze Secures Shaft-Mounted Parts	Scan	12/23 132 (0.5)
Loading Ramp Automatically Finds Truck Mechanical Thumb Flips Paperback's Pages	DIA	1/7 32 (0.6)
Rolling-Contact Cams Vary Suspension Spring Rates	DIA	2/18 22 (1.2)
Off-Road Truck Tucks Up Wheels to Dump	DIA	2/4 23 (1.0)
Japanese Excavator Digs and Dumps with Swinging Booms	DIA	4/1 32 (1.0)
Swing-Out Rollers Speed Printing Press Output	DIA	4/29 39 (0.7)
	DIA	8/19 31 (1.0)

## 353-355. Couplings, U-Joints, Shafts

Constant-Velocity Universal Ball Joints	Miller	4/15 184 (4.3)
Estimating Universal Joint Performance Variations	Lee	7/8 151 (3.0)
Torque Converters	Wirry	MD 6/17 34 (3.0)
Fluid Couplings	Lavoie	MD 6/17 51 (2.0)
Couplings	Grundtner	MD 6/17 59 (6.0)
Universal Joints	(Chapter)	
Flexible Shafts		MD 6/17 65 (4.0)
High-Speed Rotors	Zambetti	MD 6/17 69 (3.0)
Pneumatic-Hydraulic Balance Controls	Satchwell	9/16 183 (2.0)
Clutch Torque	Scan	2/4 112 (1.0)
Triple-Nested Springs Form Universal Joint	Scan	2/18 171 (0.6)
Circular Spring Softens Gear Shock	Scan	3/4 124 (1.0)
Deformable Sleeves Absorb Shock in Coupling	Scan	4/1 114 (0.5)
Wrapped Cord Forms Spiral "Teeth"	Scan	4/1 117 (0.5)
Cantilevered Gears Permit Planetary Flex	Scan	5/13 188 (1.0)
Torsion Bars Form Variable-Speed Transmission	Scan	6/10 158 (1.0)
Coupling Varies Stiffness According to Torque	Scan	8/5 128 (1.0)
Retarded Spin Allows Full-Speed Coupling	Scan	12/23 110 (1.0)
Bogieless Railway Car Turns on Skewed Axles	DIA	7/8 31 (1.0)
Cross-Shaft Protects STOL Aircraft	DIA	12/9 26 (1.0)

## 37, 39. Controls and Systems

Hot Squeeze Pushes Piston	Scan	4/15 162 (0.5)
Paired Gratings Measure Light Angle	Scan	4/29 213 (0.6)
Intermeshed Fingers Control Drag	Scan	7/8 127 (0.5)
Notched Latch Provides Torque Fuse	Scan	7/8 128 (1.0)
Paddle Wheels Form Digital Readout	Scan	3/18 176 (1.0)
Displaced Image Measures Torque	Scan	3/18 178 (0.5)
Speed-Sensitive Pitch Adjustment	Scan	7/8 127 (0.5)
Speed-Sensitive Balls Adjust Rotor Balance	Scan	9/30 119 (1.0)
Spring Push Limits Fan Speed	Scan	10/28 150 (1.0)
Paper Pincher Detects Double Documents	DIA	6/10 22 (2.0)
Sweeping Switch Arm Operates Three-Digit Readout	DIA	9/2 37 (0.5)

## 356. Clutches, Brakes

Spring Clutches	Rudnickas	5/13 182 (5.0)
Miniature Electric Clutches and Brakes: Part 1—Friction-Disc Types	Pech	4/15 150 (9.0)
Miniature Electric Clutches and Brakes: Part 2—Nonfriction Types	Pech	4/29 223 (5.0)

## 41. Fasteners

Plastic Fasteners	Poe	1/7 127 (5.0)
High Temperature Joints	Baumgartner	1/21 166 (6.0)
Metal/Plastic Assemblies	Ehner	2/18 183 (3.0)
Terminology	Belford	F 3/11 4 (4.0)
Fastener Materials	(Chapter)	F 3/11 8 (4.0)
Finishes and Coatings	(Chapter)	F 3/11 12 (3.0)
Joint Design	(Chapter)	F 3/11 15 (14.0)
Fastener Evaluation	Brenner	F 3/11 29 (3.0)

Tapping Screws	(Chapter)	F 3/11 32 (6.0)
Set Screws	Kull	F 3/11 38 (4.0)
Studs	Waltermire	F 3/11 42 (2.0)
Resistance Welded Fasteners	Grey	F 3/11 44 (3.0)
Arc-Welded Fasteners	Singleton	F 3/11 47 (4.0)
Locknuts	(Chapter)	F 3/11 51 (4.0)
Single-Thread Engaging Nuts	Seitz	F 3/11 55 (3.0)
Anchor Nuts	Mihaly	F 3/11 58 (2.0)
Caged Nuts	Seitz	F 3/11 60 (2.0)
Clinch Nuts	Massey	F 3/11 62 (2.0)
Self-Piercing Nuts	Steward	F 3/11 64 (2.0)

Inserts	Mussgnug	F 3/11	66	(4.0)	Vibration-Isolation Systems: Part 1	Feinberg	7/22	138	(7.0)
Washers	Hurst	F 3/11	70	(4.0)	Vibration-Isolation Systems: Part 2	Feinberg	8/5	142	(8.0)
Sealing Fasteners	(Chapter)	F 3/11	74	(4.0)	Spring Selection Simplified	Johnson	9/16	192	(5.0)
Pin Fasteners	Braendel	F 3/11	78	(5.0)	Built-In Damping: Part 1—The Theory	Thorn	11/25	174	(6.0)
Small Rivets	(Chapter)	F 3/11	83	(4.0)	Built-In Damping: Part 2—The Design				
Blind Rivets	Freeman	F 3/11	87	(3.0)	Method	Thorn	12/9	166	(6.0)
Spring Clips	Seitz	F 3/11	90	(6.0)	Belleville Washer Relieves Pressure	Scan	1/7	125	(0.5)
Stamped Retaining Rings	Wurzel	F 3/11	96	(3.5)	Flat-Wire Spring Pushes in All Directions	Scan	3/4	127	(0.6)
Wire-Formed Retaining Rings	Munsey	F 3/11	99	(3.0)	Two Stage Isolator Does Double Duty	Scan	5/13	187	(1.0)
Spiral-Wound Retaining Rings	McCormick	F 3/11	102	(5.5)	Resilient Ring Provides Soft Bearing				
Quick-Operating Fasteners	Barry	F 3/11	108	(4.0)	Mount	Scan	5/13	189	(0.6)
Matching Fastener Holes	Bennett	4/1	127	(2.0)	Buckled Springs Lift Platform	Scan	6/10	159	(0.5)
Resistance-Welded Fasteners	Olszewski	6/10	169	(5.0)	Spring Reinforces Coupling	Scan	6/10	160	(0.5)
Bolt Point Reactions	Yenger	6/24	181	(2.0)	Spring Clutch Locks Nut	Scan	6/10	160	(0.5)
Nut Design Factors	Viglione	8/5	137	(5.0)	Cantilever Springs Maintain Hot Wire				
Machine Set Studs	Johnson	8/19	166	(3.0)	Tension	Scan	6/24	142	(0.5)
Fastener Preload	Blake	9/30	128	(4.0)	Suspended Tape Cancels Vibration	Scan	6/24	144	(0.5)
Explosion in Tubing Gently Separates	Trends	4/29	10	(0.6)	Squeezed Spring Accommodates Seal				
Rocket Stages	Scan	2/18	172	(1.0)	Fluctuations	Scan	10/14	197	(1.0)
Double Nut Provides Two-Speed Linear Drive	Scan	3/18	177	(0.5)	Deforming Wire Absorbs Shock	Scan	12/23	111	(1.0)
Screws Drive Telescoping Cylinder	Scan	8/5	126	(1.0)	Suspended-Cable Floor Eliminates Audible				
Push-Pull Nut Tightens Without Torque	Scan	9/16	175	(0.5)	Reflections	Scan	12/23	112	(0.5)
Collapsible Notches Yield Continuous Ring	Scan	9/30	118	(0.5)	Multi-Wheel Trailer Integrates Undulations	DIA	4/1	34	(0.5)
Segmented Nut Separates Explosively	Scan	10/14	198	(0.5)	Hydraulic Crash Barrier cushions Car Impact	DIA	10/14	40	(1.0)
Dual Threads Double-Lock Blind Fastener	Scan	10/14	198	(0.5)					
Cocked Washer Provides Torqueless Screw Lock	Scan	10/14	198	(0.5)					
Slotted Bolt Locks Itself	Scan	10/14	200	(0.5)					
Flexible Threads Distribute Load	Scan	10/28	152	(0.5)					
Spherical Seat Accommodates Bolt Tilt	Scan	10/28	175	(0.5)					
Retaining O-Rings Ease Coupling Assembly	Scan	11/11	196	(0.5)					

## 42. Springs; Vibration and Shock Isolators

Air Springs	Hirtreiter	4/1	104	(9.0)
Maximum Velocity of Springs	Morcos	6/24	145	(4.0)
Elastomeric Mounting Systems	Meyer	6/24	184	(3.4)

## 43. Other Assembly Components

Designing Lifting Attachments	Moore	3/18	181	(4.7)
Music-Wire Tire Will Absorb Road Shocks on the Moon	Trends	1/21	14	(0.6)
Rotating Cushions Float New Transporter Over Any Terrain	Trends	5/13	12	(0.5)
Joint Makes Tubes Self-Clamping	Scan	7/22	148	(0.5)
Flexing Beam Permits Knob Override	Scan	8/5	127	(0.5)
Flip-Flop Latch Indicates Position	Scan	10/14	199	(0.6)
Meshed Gear Segments Form Continuous Hinge	Scan	11/11	198	(0.5)
Bolt-On Rollers Make Semipermanent Conveyor System	DIA	3/4	28	(0.5)

# Materials

## 51. Ferrous Metals

High-Alloy Ultra High Strength Steels	Hamaker	6/10	187	(5.0)
Fatigue in Constructional Steels: Part 1—Basic Considerations	Martin	8/5	130	(7.0)
Fatigue in Constructional Steels: Part 2—Application of Fatigue Data	Martin	8/19	161	(5.0)
Gray, Ductile, and High-Alloy Irons	Walton	M 9/9	4	(7.0)
Malleable Iron	Heine	M 9/9	11	(3.0)
Carbon and Low-Alloy Steels	Briggs	M 9/9	14	(5.0)
High-Alloy Steels	Schoefer	M 9/9	19	(6.0)
Carbon Steels	Parker	M 9/9	25	(7.0)
High-Strength Low-Alloy Steels	Sullivan	M 9/9	32	(4.0)
Low and Medium-Alloy Steels	Whiteley	M 9/9	36	(4.0)
Stainless Steels	Kopeki	M 9/9	40	(4.0)
High-Temperature, High-Strength Iron-Based Alloys	Johnson	M 9/9	44	(5.0)
Ultrahigh-Strength Steels	Hall	M 9/9	49	(2.0)
Free-Machining Steels	Nachtman	M 9/9	51	(3.0)
Understanding Fatigue in Metals	Kling	10/14	202	(7.0)
Steel Head Shapes	Glazebrook	10/28	159	(4.0)
Super 12-Cr Steels	Parker	11/25	160	(12.0)
Deep Diving Alvin Relies on High-Alloy Sphere	Trends	6/24	12	(0.5)
ASTM Recognizes Controlled Ferrite in Alloy Castings	Trends	8/19	170	(1.0)
Frequency Change Tells Metal's Hardness	DIA	5/27	41	(0.5)

## 52. Nonferrous Metals

Continuous-Cast Copper-Base Alloys	Bailey	2/4	106	(6.0)
High-Strength Aluminum Alloys	Boone	2/18	164	(6.0)
Welded Aluminum Parts	Collins	3/4	128	(6.0)
Aluminum	Rowe	M 9/9	54	(11.0)
Copper	Strubell	M 9/9	65	(8.0)
Nickel	Hall	M 9/9	73	(8.0)
Magnesium	Hanawalt	M 9/9	81	(5.0)
Zinc	Horwick	M 9/9	86	(3.0)
Titanium	Erbin	M 9/9	89	(4.0)
Beryllium	Hawk	M 9/9	93	(2.0)
Refractory Metals	Chelius	M 9/9	95	(4.0)
Precious Metals	Lake	M 9/9	99	(3.0)
Soldering Alloys	Smith	M 9/9	102	(3.0)
Brazing Alloys	Pattee	M 9/9	105	(4.0)
Understanding Fatigue in Metals	Kling	10/14	202	(7.0)
Aluminum for Cryogenic Applications	Kaufman	11/11	199	(7.0)
Two Containers and Cap Win Packaging Design Awards	Trends	4/29	24	(1.0)
Aluminum-Block Engine Powers Chainsaws	DIA	1/21	22	(1.0)

## 53, 54. Plastics, Rubber, Elastomers

Plastic Fasteners	Poe	1/7	127	(5.0)
TFE Fluorocarbon Parts	Ricklin	1/21	152	(5.0)
Polypropylene Linkage	Meyer	3/18	179	(2.0)
Lubricating with Elastomers	Thomas	4/1	136	(2.8)
Whisker-Reinforced Plastics	Milewski	5/13	216	(4.4)
TFE-Lubricated Phenolics	Willis	5/27	130	(8.0)
Polycarbonates	Thomas	6/10	162	(7.0)
Polysulfone	Bugel	7/22	193	(2.1)
Elastomers	Mathews	8/19	177	(20.0)
Plastic Sports Car	Trends	1/21	10	(1.0)
Reinforced Plastics Win Design Awards	Trends	4/15	24	(1.0)
Plastic Design Called Practical for High-Rise Steel Buildings	Trends	9/2	14	(0.6)
Plastic Frame Joins Plastic Body Halves	Trends	10/14	10	(0.6)
New Process Casts Plastics by the Mile	Trends	10/28	168	(1.0)
Plastic Racer Named Champion for '65	Trends	12/9	12	(0.7)
Foam Quiets Wind's Whistle	Scan	1/21	164	(0.5)
Sticky Beads Form Intricate Insulation	Scan	5/13	190	(0.6)
Spiral Strip Eliminates Conveyor Bearing	Scan	9/16	176	(0.5)

## 55-58. Nonmetallics, Composites

Sandwich Panels	Gallagher	1/7	143	(5.0)
Open-Face Sandwich Panels	McKinley	2/4	141	(5.0)
Matching Seals and Lubricants	Stephens	1/21	172	(5.0)
Submarine of Glass	Ernsberger	4/29	186	(7.0)
Brittle Materials	Robinson	9/2	118	(5.0)
Coatings	Beach	M 9/9	116	(6.0)
Filament-Wound Cocoons Could Prevent Submarine Disaster	Trends	2/18	12	(0.5)
Nondestructive Test Predicts Strength of Adhesive Bonds	Trends	3/4	141	(1.0)
Eight-Mil Films Bond the F-111 Fuselage	Trends	6/10	10	(1.0)
Crankcase Oil Helps Prevent Forest Fires	Trends	9/16	14	(0.5)
Glass 'Sub Hulls' Pass Three-Year Submergence Tests	Trends	9/16	24	(0.5)
Sticky-Fingered Machine Tests Adhesives	Trends	9/16	186	(0.6)
Varnishing Process Cuts Motor Costs	Trends	10/14	221	(0.6)
Electrically Conductive Cloth Makes New Heater Types Feasible	Trends	11/25	182	(0.7)
Curved Glass Adds Safety and Comfort to Transit Car	Trends	12/9	10	(0.6)
Iodine Solves Slippery Problem in Exotic Metals	Trends	12/9	179	(0.8)
Honeycomb Proves Best for Small Underwater Vehicles	Trends	12/9	182	(2.0)
Solidification Throws Thermal Switch	Scan	4/29	216	(0.5)
Ripples Boost Corrugation Strength	Scan	9/2	125	(1.0)
Rubber Ram Tests Paper Strength	DIA	3/4	30	(0.5)
Rocking Film Makes 3-D Photo	DIA	6/10	34	(0.5)

# Manufacturing Methods and Processes

## 61-63. Metal Casting, Shaping, Forming

Forging vs. Machining	Divine	5/13 192	(5.0)
Steel forgings	Parker	7/22 153	(9.0)
Casting	Wallace	M 9/9 122	(4.0)
Forging	Burbank	M 9/9 126	(3.0)
Extruding	Cullen	M 9/9 129	(3.0)
Cold Extruding	Schiller	M 9/9 132	(2.0)
Cold Heading	Havlis	M 9/9 134	(2.0)
Stamping	Carter	M 9/9 136	(2.0)
Deep Drawing	Bartle	M 9/9 138	(2.0)
Spinning	Wenman	M 9/9 140	(2.0)
Roll Forming	Vanderploeg	M 9/9 142	(2.0)
High-Energy-Rate Forming	Zernow	M 9/9 144	(3.0)
Powder Metallurgy	Johnson	M 9/9 149	(2.0)
Designing Stamps	Strasser	11/25 172	(2.0)
Punched Holes in Stamps	Strasser	12/23 113	(3.0)
Die Castings Guide the Nike Hercules	Trends	5/27 24	(0.5)
Superplasticity Promises New Metal-Forming Methods	Trends	7/8 147	(1.0)
Hybrid Process Makes Die-Cast forgings in Brass	Trends	7/22 183	(1.0)
Support Rollers Aid Cylinder Forming	DIA	2/4 30	(0.5)
Self-Feeding Precision Forge Generates Rounds and Squares	DIA	4/15 26	(2.0)
Bar-Bender Rolls Curl Heavy Stock	DIA	9/16 34	(0.5)

## 64. Metal Joining

Welded Aluminum Parts	Collins	3/4 128	(6.0)
Bonding and Welding Dissimilar Metals	Gatzek	4/29 270	(6.2)
Laser Welding	Miller	8/5 120	(6.0)

Welding and Welding Alloys	Rudy	M 9/9 109	(7.0)
Diffusion Welding	Albom	9/16 179	(4.0)
Ultrasonic Joining	Gellert	12/23 136	(2.6)
Cold Welding Called Promising as Manufacturing Technique	Trends	6/10 14	(0.5)
Zero Leakage Now a Realistic Goal	Trends	9/16 188	(1.0)
Dual Triggers Fire Four-Step Welding Gun	DIA	2/4 30	(0.5)
Pistol-Like Magazine Feeds Stud Welder	DIA	3/18 26	(1.0)
Wedges Secure Fastener-Free Aluminum Hull	DIA	5/13 42	(0.7)
Electron-Beam Focus Can Be Changed During Operation	DIA	6/10 32	(1.0)
Desoldering Irons Inhale Molten Metal	DIA	11/11 37	(1.0)

## 65-68. Machining, Other Processes

Forging vs. Machining	Divine	5/13 192	(5.0)
Joining of Thermoplastics	Burns	5/27 164	(4.5)
Ion-Sputtered Thin Films	Seeman	8/19 200	(3.8)
Machining	Olofson	M 9/9 147	(2.0)
New Etching Process Produces Sharp Detail	Trends	11/25 180	(0.6)
Transducers Control Space Age Spinning Wheel	DIA	4/15 30	(1.0)
Hot-Coating Process Protects Gears or Gimbals	DIA	4/29 32	(2.0)
Die Stack Shaves Tiny Teeth in Gear Blank	DIA	4/29 36	(1.0)
Oscillating Abrasive Wire Slices Semiconductor Crystals	DIA	5/13 39	(1.0)
Laminator Glues Up Beams From Boards	DIA	8/19 28	(1.0)

# Design Theory and Techniques

## 71. Mechanics, Dynamics, Vibration

Vibration Parameters	Korze	4/1 133	(3.0)
Reflected Inertia	Bowers	8/5 155	(2.0)
Strobes for Vibration Measurement	Kivenson	9/2 126	(8.0)
Stresses at Resonance	Reinert	10/14 227	(6.0)
Estimating Natural Frequencies	Schmitt	12/9 172	(7.0)
New Analysis Method Pins Down Vibration in Weldments	Trends	10/28 169	(1.0)
Shutting Wires Transmit Vibration	Scan	10/14 201	(0.5)
Push-Pull Wires Indicate Torque	Scan	12/23 112	(0.5)
Test Table Tunes Out Random Vibration	DIA	1/21 23	(1.0)
Resonant Masses Shake Sorting Screen	DIA	1/21 28	(0.5)

## 72, 73 Strength of Materials, Parts

Predicting Part Failures—Part 1	Johnson	1/7 137	(6.0)
Predicting Part Failures—Part 2	Johnson	1/21 157	(6.0)
High Temperature Joints	Baumgartner	1/21 166	(6.0)
Fatigue Stress Using Mohr's Circle	Little	3/4 143	(6.0)
Ring Redundancy of Cantilevered Ring Segments	Isakower	3/4 149	(3.0)
Precision Elastic Limit	Ojalvo	3/18 191	(4.5)
Bending Moments in Circular Plates	Jennings	4/15 163	(3.0)
Counteracting Gasket Creep	Boutier	4/29 233	(2.0)
Preventing Fatigue Failure	Smoley	5/27 142	(4.0)
Bending Without Twisting	Kaechele	7/22 188	(2.2)
Rotating Shaft Deflection	Johnson	11/11 227	(3.0)
Stress Concentrations for Holes in Cylinders	Hesse	12/9 185	(4.6)
	Little	12/23 133	(3.0)

## 74. Human Factors, Industrial Design

Survival in the Marginals	(Article)	1/7 110	(5.0)
Space Suit Progress—1: Dress Rehearsals for Apollo	Barnes	2/4 100	(6.0)
Space Suit Progress—2: Hot Stunt Men and Hydraulic Stand-Ins	Barnes	2/18 160	(4.0)
Human Vibration Limits	Barnes	6/10 144	(6.0)
Warning-Systems Design	Semnara	9/30 106	(11.0)
Computer "Corrects" the Road During Auto-Driver Reaction Studies	Trends	2/4 10	(0.7)
Safety and Entertainment Stressed in New Idea Car	Trends	2/18 10	(0.6)
Zero-Friction Vehicle Zero-g for Astronauts	Trends	3/4 14	(0.7)
Zero-Gravity Bed Buys a Patient and Relieves His Pain	Trends	5/13 12	(0.5)
"Marinated" Researchers Test Zero-G Reactions	Trends	9/30 10	(0.5)

IDSA Presents Design Awards	Trends	10/14 22	(1.6)
Crashing Cadavers Contribute to Dummy Design	Trends	11/11 12	(0.5)
Air-Spring Seat Conforms to Any Size Trucker	DIA	5/13 26	(2.0)
Scuba Life Jacket Safeguards Downed Pilot	DIA	8/19 26	(1.0)
Styling Keynotes German 66's	DIA	11/25 26	(0.5)
Turning Lens Duplicates Human Field of View	DIA	11/11 26	(2.0)

## 75. Design Analysis, Dimensioning

Sandwich Panels	Gallagher	1/7 143	(5.0)
Fatigue Stress Using Mohr's Circle	Little	3/4 143	(6.0)
Geometric Computing—Part 1: The Method and Its Application	Gellert	3/18 152	(8.0)
Redundancy	Nichols	3/18 170	(4.0)
Natural Frequencies of Cantilevered Ring Segments	Ojalvo	3/18 191	(4.5)
Geometric Computing—Part 2: Fields of Application	Gellert	4/1 94	(7.0)
Feedback Control Systems: Part 1—Tools of the Trade	Branson	4/15 166	(5.0)
Nomographs from Experimental Data	Bolthouse	4/15 171	(3.0)
Geneva Wheel Inertia	Weiss	4/15 181	(2.0)
Feedback Control Systems: Part 2—Deriving Block Diagrams	Branson	4/29 217	(6.0)
Feedback Control Systems: Part 3—Graphical Techniques	Branson	5/13 201	(5.0)
Graphic Data Processing	Smith	5/27 117	(7.0)
Natural Frequencies of Thin Rectangular Plates	Vet	6/10 183	(3.0)
Designing Rotary Inertia Systems	Mischke	6/24 134	(7.0)
Verifying the Installation of Products	Finch	8/5 102	(6.0)
Physical Schematic Diagrams	Roth	9/2 137	(3.0)
Thin Cantilever Beams	Meyer	9/2 147	(3.0)
Analyzing Mechanisms with an Analog Computer	Keller	10/28 153	(6.0)
Temperature Change in Hydraulic Systems	Dodge	10/28 163	(3.0)
Momentary Peak Shaft Loads	Tuplin	10/28 171	(4.5)
Developing Schematics	Feist	11/11 186	(8.0)
Plain-Talk Computer Cuts Calculating Time	Trends	4/15 14	(0.6)
Proposed Helicopter: Swiveling Tail Rotor Propels and Steers	Trends	5/13 14	(0.6)
Computer-aided Drafting 25 Times Faster than Man	Trends	6/24 129	(0.5)
Signatures in Sound Diagnose Machine Illnesses	Trends	8/19 14	(0.6)
Computer Processes Engineering-Change Notices	Trends	9/30 134	(2.0)
Design Data to Manufacturing Instructions in Minutes	Trends	11/25 185	(0.8)
Gemini Rendezvous Practiced in Sliding Simulator	DIA	1/7 28	(1.0)

## 76. Basic Sciences

Progress Toward Intelligent Machines	1/7 148 (3.6)
Exploiting the Oceans	3/4 114 (5.0)
Mounting Optical Elements	7/8 133 (3.0)
Infrared	9/16 154 (6.0)
Optics and Optoelectronics	10/28 180 (0.6)
Gamma Beam Teams with Radar to Warn Pilots of Dangerous Air	Trends 11/11 22 (0.5)
Overlapping Images Measure Rod Diameter	Trends 4/15 160 (1.0)
Liquid-Metal Studies Pinpoint Radiator Design Problems	Trends 9/16 14 (0.5)
Force-Field Theory Explains Molecular Sieve's Shortcomings	Trends 11/11 22 (0.5)
Optical Lever Measures Displacement	Scan 5/27 150 (0.5)
Wiggling Mirror Indicates Cavity Shape	Scan 8/5 129 (1.0)
Vibrating Mirrors Indicate Light Beam Position	Scan 9/16 175 (0.5)
Circulating Sand Heats Air	Scan 9/16 176 (0.5)
Fly's-Eye Lens Makes 1250-Image Photo	DIA 2/4 28 (1.0)

Critical Tests Will Decide the Future for Inflatable Space Structures  
Progress Is Reviewed on the Fixed-Wing Supersonic Transport  
Molab Life Support Systems Pass First Tests in a Mockup  
For '66: R & D Spending To Be Up Slightly

Trends	4/29 12 (0.5)
Trends	4/29 14 (0.6)
Trends	4/29 22 (0.7)
Trends	12/23 6 (0.5)

## 77. Experimental, Advanced Design

Are Bigger Machines Better?	Wise 5/27 124 (6.0)
Progress Report on Rigid Rotors	Trends 1/7 12 (0.5)
400 mph Called Feasible for Rigid Rotor Helicopter	Trends 1/7 12 (0.5)
Profilometer Shows Road Blemishes Can Ruin the Ride	Trends 2/4 12 (0.5)
Progress Reported on Two Apollo Boosters	Trends 2/18 14 (0.5)
Hot Gas Spins Helicopter Rotor	Trends 2/18 14 (0.5)
Meteorooids Riddle Pegasus Wings As Scheduled	Trends 3/18 14 (0.6)
SST Design: Double-Delta Is Checking Out in Wind-Tunnel Tests	Trends 4/15 12 (0.7)
Hardware Is Ready: Surveyor Prepares for the Moon	Trends 4/15 22 (1.0)

## 78. Environmental Design

Corrosion Resistance	Groves 4/1 119 (5.0)
Off-the-Shelf Oceanography	Barnes 8/5 114 (6.0)
Lunar Landing Research Vehicle	Barnes 11/25 146 (5.0)
Crackups and Cartoons Help Solve Lunar-Landing Problems	Trends 4/1 12 (0.7)
Hazards Are About As Predicted	Trends 5/13 22 (1.5)
Particles and Plasma Pommel the Packages	Trends 5/13 24 (0.5)
Moon-Machine Instruments Will Be Tested Aboard Earth Lab	Trends 5/27 12 (0.6)
Picking Up the Pace on Apollo Mariner Success Seems Assured for July 14	Trends 5/27 22 (1.5)
Gemini 5 Orbit Time Will Match One Apollo Trip	Trends 7/8 12 (1.0)
Inflatable Still Desalts Ocean Water	Trends 9/16 10 (0.5)
Satellites Hint Meteoroids Aren't Too Dangerous	Trends 9/16 12 (0.5)
Deepstar-4000 Makes Ready for Dives to Design Depth	Trends 9/30 12 (1.0)
Dam Divers Defeat Decompression Dilemma	Trends 11/25 14 (1.3)
Spacecraft Testers Will Work in a Vacuum	Trends 12/9 10 (0.7)
Aluminaut Sets a Diving Record	Trends 12/9 14 (0.6)
Sea Sarong: A New Look in Wet-Suit Design	Trends 12/23 6 (0.5)
Foam-Filled Solar Mirror Inflates in Space	DIA 9/16 30 (1.0)

# Engineering Management, Personal

## 81-84. Engineering Department Operations

The Disposable Engineers	Bard 2/18 158 (2.0)
Selecting the Right Research Project	Suits 4/1 90 (3.0)
Project Scheduling—The Second Generation	O'Brien 4/29 172 (10.0)
Follow-up Techniques for Successful Delegation	Burgess 4/29 183 (3.0)
Engineering Proposals	Morris 5/13 164 (5.0)
New Graphic Symbols for Fluid-Power Circuits	Long 5/13 211 (5.0)
Engineering Impact	Rader 5/27 113 (3.0)
Someone Has To Do the Work!	Lloyd 6/10 143 (1.0)
Creative Disorganization	Bard 6/24 130 (2.0)
Engineering Manpower Audit	Runyon 7/8 102 (8.0)
Programmed Instruction for Engineers—Part 1	Gould 7/22 122 (6.0)
What is a "Test"?	Young 7/22 129 (3.0)
Programmed Instruction for Engineers—Part 2	Gould 8/5 108 (4.0)
Evaluate Your Engineers	Marvin 11/11 168 (4.0)
The Search for Supervisors	Hoffman 11/25 132 (5.0)
Profit Improvement Program for Design Engineering	Poyer 12/23 88 (6.0)
Engineering Supervision—2: What Supervisors Do	(Article) 12/23 94 (3.0)
Engineers Needed, 1973	Trends 1/7 108 (0.5)
Survey Shows Increase in Engineering Salaries	Trends 3/18 150 (0.8)
Drafting by Computer	Trends 6/10 12 (0.7)
"Lab Road" Creates Hills for Full-Size Truck Testing	Trends 7/22 14 (0.6)
DoD Personnel Ask Questions First, Research Later	Trends 9/16 152 (0.6)
Role of Engineers in Management Is Discussed	Trends 10/14 178 (0.6)
Flexible Platen Marks on Curve	Scan 8/5 127 (0.5)
Desk-Top Copier Makes Reproductions of Any Length	DIA 2/4 26 (1.0)
Plotting Table Makes Program Tape	DIA 2/18 30 (0.5)
Tripod Compass Draws Error-Free Ellipses	DIA 3/4 28 (0.5)
Drawing Blade Goes in Circles	DIA 9/16 42 (0.5)
T-Shaped Tracer Eases Pipe-Drawing Chores	DIA 9/30 35 (0.5)

Fluid-Power Standards	Pippenger 5/13 197 (4.0)
Plan Ahead for Publication	Olson 10/28 126 (5.0)
Classifying Information	Taulbee 12/9 191 (3.5)
Images Appear from Microfilm Wand	DIA 12/23 26 (1.0)

## 87. Personal and Professional

Ivorvtower'sm	(Articles) 1/7 102 (3.0)
In-Plant Engineering Refresher Course	Ziemke 1/21 142 (4.0)
The Great Debate: Which Way Engineering Education	(Article) 3/4 102 (1.0)
The Great Debate: An Industrialist's Viewpoint	Rader 3/4 103 (2.0)
The Great Debate: An Educator's Viewpoint	Davidson 3/4 105 (3.0)
The Great Debate: A Space Engineer's Viewpoint	Purser 3/4 108 (2.5)
European Engineer	Williams 3/18 138 (12.0)
Stimulating Invention	(Article) 4/1 86 (4.0)
Learn to Play Your Hunches	Raudsepp 4/15 132 (6.0)
A Consulting Career	Campbell 4/15 139 (3.0)
Money Can Compromise Creativity	Macklin 5/13 169 (2.0)
Testing for Creativity—Part 1: Cognitive Problem-Solving Tests	Raudsepp 5/27 106 (7.0)
Testing for Creativity—Part 2: Perception-Personality Tests	Raudsepp 6/10 136 (6.0)
Testing for Creativity—Part 3: Personality Tests	Raudsepp 6/24 122 (7.0)
Management Clinic: Protecting Trade Secrets	Marvin 7/8 112 (2.0)
State of the Unions—Part 1: Engineers' Attitudes toward Unions	(Article) 8/19 140 (5.0)
State of the Unions — Part 2: How Unions Affect Engineers	(Article) 9/2 102 (3.0)
Management Clinic: Let Go of Technical Details	Schrenk 9/2 105 (2.0)
Designing a Resume That Sells	Andrews 9/16 146 (4.0)
Engineers Appraise Societies	(Article) 9/16 150 (2.0)
Engineering-Technician Certification	Peterson 9/30 88 (4.0)
It's Better to Work for Yourself	Gernhardt 9/30 92 (1.0)
Conformity and the Engineer—Part 1	Raudsepp 10/14 172 (6.0)
Management Clinic: Prospects for Engineers in Top Management	Rader 10/14 179 (2.0)
Conformity and the Engineer—Part 2: Constructive Nonconformity	Raudsepp 10/28 122 (4.0)
The Engineer in Research	Raudsepp 11/11 172 (4.0)
Improve Your Image	Dunn 11/25 138 (4.0)
Engineering Supervision—3: Supervisors Rate Their Engineers	(Article) 12/9 134 (4.0)
Technical-Manpower Market Looks Good Through 1970	Trends 11/11 176 (0.5)
High-School Image of Engineering Is Fuzzy	Trends 12/9 138 (0.7)
Conferees Discuss Problems of the Professional Engineer in Industry	Trends 12/23 97 (1.0)

## 85-86. Technical Information, Patents

Indexing vs Classification	Lancaster 1/7 105 (3.0)
Tonic for Technical Talks	Ebel 1/21 136 (4.0)
Patent Right and Rewards	(Article) 2/4 94 (5.0)
Problems with Patents	(Article) 2/18 152 (5.0)
Fluid Power Graphic Symbols	Long 2/18 199 (6.0)
Should the U. S. Stamp Out Patents?	(Article) 3/4 111 (3.0)

# Specific Machines and Equipment

## 911. Ordnance, Missiles

	Articles	1/7 115 (3.0)
Shells Into Orbit	Article	10/28 132 (4.0)
A Case for Solid Rockets	Trends	6/24 14 (0.5)
Single-Barrel Missile Launcher Shoots ASROCs or Terriers	Trends	9/30 10 (0.5)
Fly-by-Wire Missile Scores Bull's-Eyes on Tanks	Trends	11/11 10 (0.5)
Sub-Hunting Torpedo Joins the Fleet	DIA	6/24 25 (1.0)
Clip-Loaded Cannon Served by Built-In Crane		

## 912. Machinery

Whirling Discs Separate Three-Component Mixture	Scan	6/24 142 (0.5)
Flexible Strip Grips Regardless of Ball Size	Scan	8/19 160 (0.5)
Demonstrator Shows Earth Orbits	DIA	1/21 26 (0.5)
Fail-Safe Carrier Puts Bite on Coil	DIA	2/4 22 (1.0)
Beach Sweeper Cleans Up After Litter Bugs	DIA	2/18 30 (0.5)
Programmed Sack Stacker Loads Delivery Trucks	DIA	3/4 22 (2.0)
No Strings on Sea-Bottom Sampler	DIA	4/1 26 (1.0)
Steel Strapper Turns Out Tight Coils	DIA	4/15 39 (1.0)
Straight Sweeping Blade Clears Wheelhouse Windshield	DIA	4/15 45 (0.5)
Washing Machine Gives Substrates Dozen Dunkings	DIA	4/29 26 (2.0)
High-Speed Roller Deburrers Flat Metal Parts	DIA	6/10 34 (0.5)
Ice-Cubes Form in Freezer Conveyor Belt	DIA	6/24 27 (1.0)
Soil Tester Pushes Itself into the Ground	DIA	7/22 30 (1.0)
X-Ray Sensor Sorts Spuds from Stones	DIA	7/22 32 (0.5)
Self-Propelled Conveyor Scoots Cargo on Powered Rollers	DIA	9/2 34 (1.0)
Excavator Digs and Rolls Under Hydraulic Power	DIA	9/16 26 (2.0)
Tea Is Served by Not-So-Dumb Waiter	DIA	9/16 39 (0.6)
Crane Mounted Conveyors Carry Crumbly-Free Coke	DIA	9/16 42 (0.5)
Hollow-Cathode Furnace Melts with Argon-Plasma Beam	DIA	9/30 28 (1.0)
Supplies Ride Ship-to-Ship Trolley	DIA	10/14 24 (2.0)
Controlled-Droop Air Lance Cleans Boiler's Tubes	DIA	11/11 30 (1.0)
Sand Stream from Paddle Wheel Smothers Forest Fires	DIA	11/25 22 (2.0)
Crane Tower Grows from Top Down	DIA	11/25 32 (0.5)
Foot Power Moves Wall-Climbing Bicycle	DIA	12/9 36 (0.5)

## 913. Electrical Machinery

Carrier's Landing System Lines Up Aircraft 20 Miles Out	Trends	4/29 14 (0.7)
LP-Disc Adds Pictures to the Music	Trends	5/27 14 (0.8)
Instrument-Panel Tape Recorder Backs Up Pilot's Memory	DIA	3/4 26 (1.0)
Sun-Pressure Vanes Stabilize Spacecraft	DIA	3/18 22 (2.0)
Plasma Jet Forms Revolving-Oven Cathode	DIA	4/29 30 (1.0)
Darting Arms Play Data From Discs	DIA	5/13 36 (1.0)
Bounced Infrared Beam Triggers Fog Horn	DIA	7/22 32 (0.5)
Phone Meter Shows Unused Talk Money	DIA	9/30 35 (0.5)
Cordless Console Handles Phone Calls Faster	DIA	10/28 22 (2.0)
Skid-and-Go Disc Plays Instantaneously	DIA	12/23 22 (2.0)

## 914. Automotive, Rail, Marine

Back-Country Sportsters	Barnes	4/15 142 (8.0)
For Manipulating Mammoths		
Merged Modules	Barnes	1/21 146 (2.0)
Highway Heavyweights	Victors	1/21 148 (4.0)
Designer for Indianapolis	Wood	5/13 174 (8.0)
Ferrari and Others Race at Le Mans	Wise	7/22 132 (6.0)
Design for the Backwater	Baranson	9/2 108 (8.0)
The Similar '66s	Wise	9/30 94 (12.0)
Turbo Titan III	(Article)	8/19 147 (4.0)
Goldenerod Goes for a Record	(Article)	9/16 162 (2.0)
Deep-Water Driller	(Article)	10/25 136 (2.0)
RR Model Change	(Article)	12/9 140 (6.0)
Commercial Deep-Water Hydrofoil Challenges Passenger Aircraft	Trends	8/5 14 (0.5)
Bronco Heads for the Hills	Trends	8/19 12 (1.0)
Power Windows Block Out Noise	Trends	8/19 171 (0.5)
ACVs Try Shuttling Passengers between Bay-Area Airports	Trends	9/2 12 (1.0)
Fastest-Working Vehicles Would Accept Daily Beatings	Trends	10/28 14 (1.0)
150-mph Ferry Proposed as Turnpike of the Future	Trends	11/11 10 (0.5)
Automatic Plow Feels for Furrows	DIA	1/7 26 (1.0)
Air Supports Jet Propelled Bubble Boat	DIA	1/7 30 (0.6)
Carriage Pulls Engineless Railcar	DIA	1/21 26 (0.5)
Diesel Truck Takes 3-Ton Load	DIA	3/18 28 (1.0)
Window-Blind Hatch Cover Speeds Bulk-Cargo Handling	DIA	3/18 32 (0.5)

French Sedan Doubles as Station Wagon	DIA	4/1 22 (2.0)
Cargo-Truck Deck Rocks and Rolls to Match Aircraft Door	DIA	4/29 28 (1.0)
Climbing Barges Bypass Locks	DIA	5/13 30 (0.5)
Rocking Foot Kicks Freight Car Along the Rails	DIA	4/9 34 (1.0)
Swing Out Decks Build Military Bridges	DIA	5/27 26 (2.0)
New Bus Series Offers Street or Highway Designs	DIA	5/27 30 (1.0)
Mechanical Pony Prances While Driver Plods Behind	DIA	7/22 24 (1.0)
Turning Seat in Swinging Cab Improves Driver's View	DIA	7/22 28 (1.0)
Cargo Van Rides on Gimbaled Trailer Frame	DIA	8/5 26 (1.0)
Truck-Body Scale Guarantees Square Meal for Cows	DIA	9/2 37 (0.5)
Squirt-Powered Cart Spots Freight Cars	DIA	9/16 36 (0.5)
Weight-Saving Design Boosts Car Payload	DIA	9/30 30 (1.0)
Radio-Controlled Plow Plants Drainage Pipe	DIA	10/14 42 (0.6)
French Truck Negotiates Tight Corners	DIA	10/14 28 (1.0)
Molten Metal Shuttled in Thermos-Bottle Car	DIA	11/25 32 (0.5)

## 914. Aircraft, Space Vehicles

Helicopters: Lethal Eagles or Sitting Ducks	Barnes	7/8 114 (6.0)
Shadowy YF-12A Will Go to SAC	(Article)	9/16 160 (2.0)
C-5A: Lockheed's Fleet in One	(Article)	11/11 178 (8.0)
Ramjet Revival	(Article)	12/23 98 (4.0)
Twin-Engine Business Planes Introduced	Trends	3/4 10 (0.7)
Size and Efficiency are Increased for DC-8s	Trends	4/29 12 (0.5)
Jet-Controlling Gyro Promises to Save Spacecraft's Fuel	Trends	5/27 10 (0.5)
Lean Teams Develop Wingless Glider	Trends	7/8 14 (0.6)
Second XB-70A Takes to the Air	Trends	8/5 10 (0.5)
OAO Prototype Proves Durable During Ground Testing	Trends	9/16 12 (0.5)
Second Lifting Body Passes the Half-Built Mark	Trends	10/14 14 (0.6)
Fold-Rotor Aircraft Would Fly 500 mph.	Trends	10/28 10 (0.6)

## 915. Instruments

Closed-Circuit Television from Mars	(Article)	8/19 150 (2.0)
Scanning Microscope Produces Photograph-Like Image	Trends	6/24 10 (0.6)
Outstanding Designs Are Honored at Trade Fair	Trends	11/11 14 (1.3)
Tapered Pin Measures Holes	Scan	4/15 161 (0.6)
Flopped Light Beam Measures Strip	Scan	5/27 141 (1.0)
Flexing Shutter Measures Pressure	Scan	5/27 140 (0.5)
Variable-Density Filters Insure Correct Exposure	Scan	6/24 144 (0.5)
Vibrating "Finger Nail" Indicates Surface Roughness	Scan	12/9 155 (1.0)
Explosive-Shutter Camera Captures Split-Second Explosion	DIA	4/1 29 (1.0)
Skuffing Pendulum Tests Road's Skid Resistance	DIA	5/13 30 (0.5)
Electrode Reaction Tells Water's Oxygen Content	DIA	5/13 34 (1.0)
Three-Eyepiece Microscope "Digitizes" 0.0001-in. Motion	DIA	5/27 33 (1.0)
Radioactive Anemometer Measures Tiny Air Gusts	DIA	5/27 41 (0.5)
Airborne Camera Horizon to Horizon	DIA	7/8 22 (2.0)
Varying Stylus Speed is Key to Torpedo Test Accuracy	DIA	7/22 22 (2.0)
Lens System Projects Color Motion Pictures	DIA	8/5 22 (2.0)
Twenty-Dollar Polaroid Says Yes When Light Is Right	DIA	8/19 22 (2.0)
Touch of a Finger Adds Balance Weights to Scale	DIA	8/19 36 (0.6)
Fan-Mounted Lenses Vary Film Image Magnification	DIA	9/2 26 (2.0)
Tape-Measure Transmitter Signals Web Width Error	DIA	9/16 32 (1.0)
Dial Looks for Bend in the Rod	DIA	9/16 34 (0.5)
Drum Head Senses Earthquake Sounds	DIA	9/16 36 (0.5)
Magnetic Pick Up Coddles Projector Slides	DIA	10/14 32 (1.0)
Detectors Keep Ultrasonic Fingers on Traffic Pulse	DIA	10/14 37 (1.0)
Microwave Interferometer Measures the Untouchables	DIA	10/28 26 (1.0)
Roving Probe Picks Off Selected Light Values	DIA	10/28 28 (1.0)
Self-Monitoring Strobe Emits Just Enough Light	DIA	10/28 30 (1.0)
Panoramic Camera Exposes Tubing Defects	DIA	11/11 28 (1.0)
Trace-Gas Density Tells Storage-Tank Content	DIA	11/11 32 (1.0)
Pulsing Bed Pad Keeps Patients Comfortable	DIA	11/25 26 (0.5)
Float-Driven Recorder Marks Tide Changes	DIA	11/25 29 (1.0)
Wire-Hung Mirror Improves Astrolabe Accuracy	DIA	12/9 32 (1.0)
Radioactive Probe Does On-the-Spot Soil Evaluation	DIA	12/9 34 (1.0)
Thermometer Senses Below 20 K	DIA	12/9 36 (0.5)